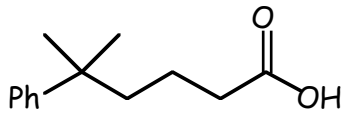
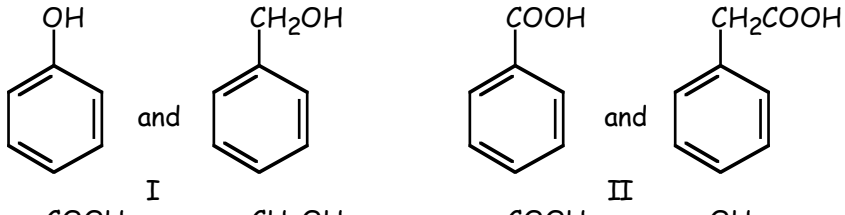
Chem 112B Homework Assignment 6
Due 22 March 2004

1. What is the IUPAC name of the following substance?



a) 5,5-dimethyl-5-phenylpentanoic acid
b) 5,5-dimehtyl-5-butanal
c) 5-methyl-5-phenylhexanoic acid
d) 2,2-dimehtylphenylpropanoic acid

2. Which mixtures can be separated by treatment with aqueous NaOH?

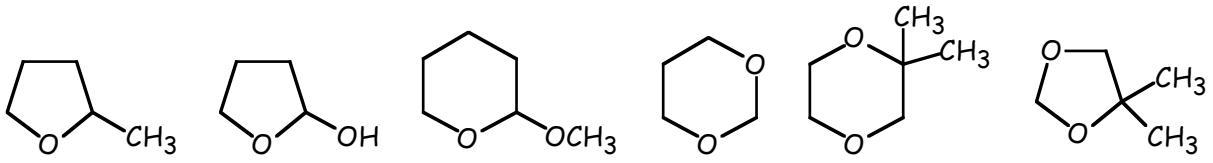


a) I, II b) I, III c) II, III d) III, IV

3. Which of the following statements is not true of carboxylic acids?

a) Carboxylic acids are almost completely dissociated in water.
b) The carbon atom of formic acid is sp^2 hybridized.
c) Carboxylic acids with five or fewer carbon atoms are quite water soluble.
d) The carbon-oxygen bonds of the formate anion are the same length.

4. Which compounds are acetals?

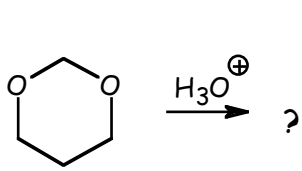


a) I, II, III b) IV, V, VI c) III, IV, VI d) II, IV, V

5. Which of the following does not have the compounds in order of decreasing (strongest first) acidity?

a) $ClCH_2CH_2COOH > CH_3CHClCOOH > CH_3CH_2COOH$
b) $CH_3COOH > CH_3CH_2OH > CH_3CH_3$
c) $CF_3COOH > CH_2ClCOOH > CH_3COOH$
d) $CF_3COOH > CH_2FCOOH > CH_3COOH$

6. What are the products of the following reaction?



a) $CH_3CH_2\overset{O}{\overset{\|}{C}}H + CH_3OH$

b) $HOCH_2CH_2CH_2OH + \overset{O}{\overset{\|}{C}}H$

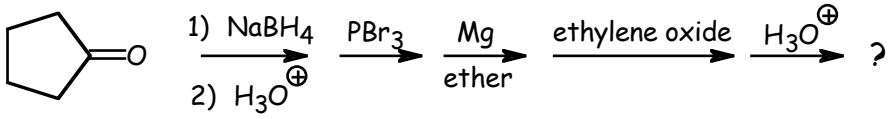
c) $CH_3\overset{O}{\overset{\|}{C}}CH_2CH_2CH_2\overset{O}{\overset{\|}{C}}H$

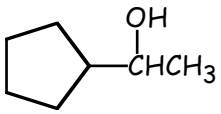
d) $H\overset{O}{\overset{\|}{C}}CH_2\overset{O}{\overset{\|}{C}}H + CH_3OH$

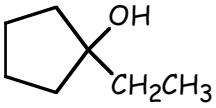
7. The reaction of an aldehyde with hydrogen cyanide is an example of _____ reaction.

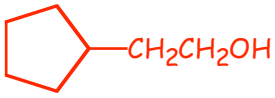
a) a nucleophilic substitution b) an electrophilic addition
c) an electrophilic substitution d) a nucleophilic addition

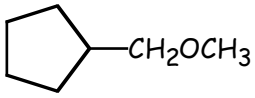
8. What is the final product of the following sequence of reactions?



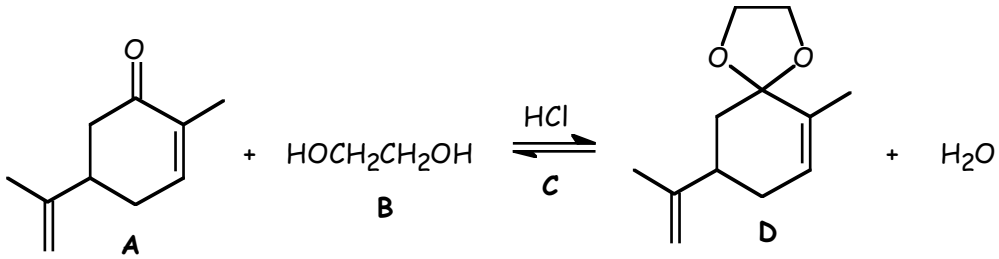
a) 

b) 

c) 

d) 

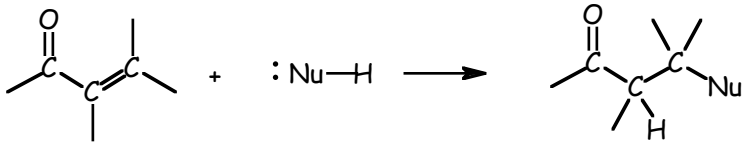
Consider the reaction below to answer the following questions.



9. The nucleophile in this reaction is:
a) A b) B c) C d) D

10. The catalyst in this reaction is:
a) A b) B c) C d) D

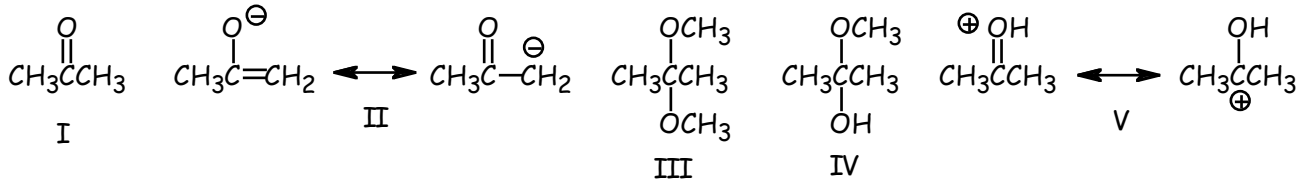
11. α,β-Unsaturated aldehydes and ketones can undergo reaction with "soft" nucleophiles at the β-carbon as illustrated below:



This reaction is called a _____ reaction.

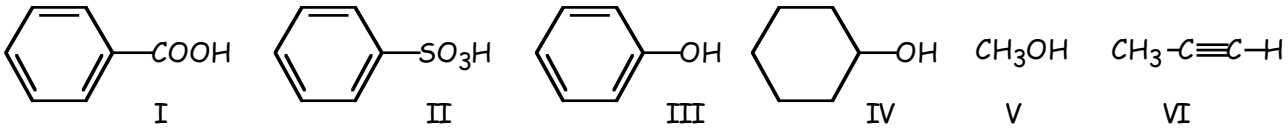
a) conjugate addition b) electrophilic addition c) direct addition d) 1,2-addition

12. Which of the following are present in the equilibrium mixture of acetone and methanol at pH 3?



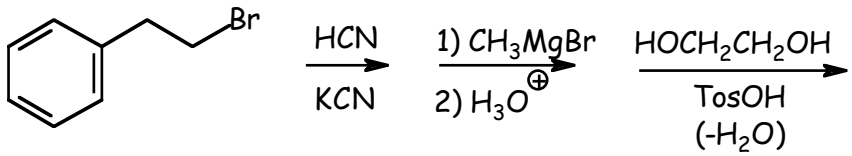
a) I, II, III b) I, III, IV, V c) I, IV d) II, III, IV

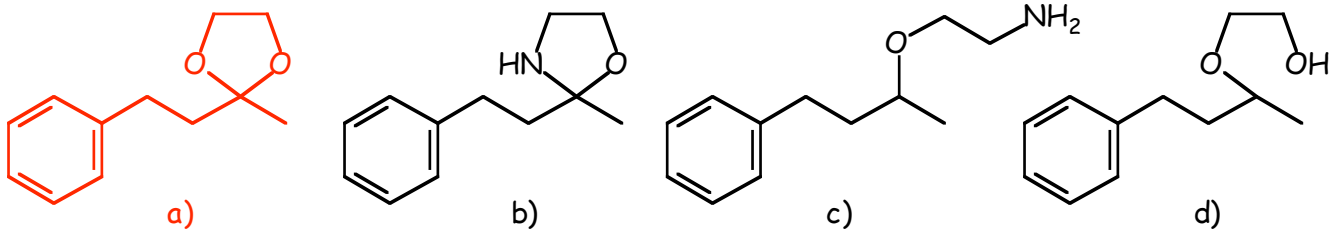
13. Arrange the following compounds in order of *increasing* acidity (weakest first).



a) III, VI, IV, V, I, II b) VI, III, IV, V, II, I c) IV, V, VI, III, II, I d) VI, IV, V, III, I, II

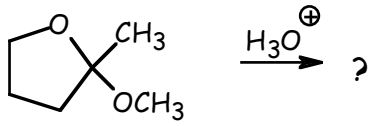
14. What is the product of the following reaction?





a) b) c) d)

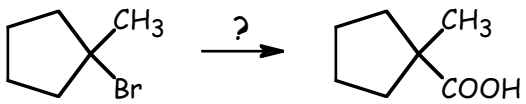
15. What is the product of the following reaction?



a) $CH_3OCH_2CH_2CH_2CHO$ b) $HOCH_2CH_2CH_2OCH_3$

c) $HOCH_2CH_2CH_2COCH_3$ d) $CH_3OCH_2CH_2CH_2CH_2OH$

16 What are the best conditions for the following transformation?



a) NaCN, then KOH, then $H_3O^{\oplus}$ b) KOH, then Ag_2O in NaOH, then HCl

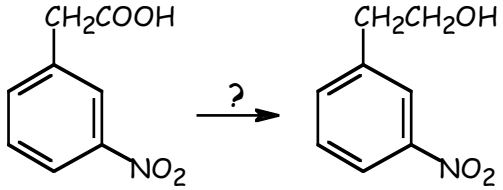
c) KOH, then CrO_3 in $H_3O^{\oplus}$ d) Mg in ether, then CO_2, then $H_3O^{\oplus}$

17. The pKa of carbonic acid (H_2CO_3) is 6.4. Which of the following compounds are soluble in aqueous sodium bicarbonate ($NaHCO_3$)?

I. Phenol II. Benzoic acid III. cyclohexanol IV. *ortho*-cresol V. 2,4-dinitrophenol

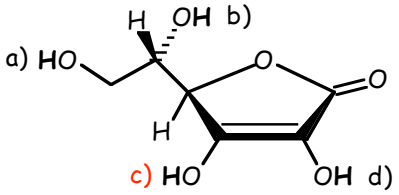
a) I, II b) III, IV c) II, V d) IV, V

18. What is the best way to effect the following transformation?

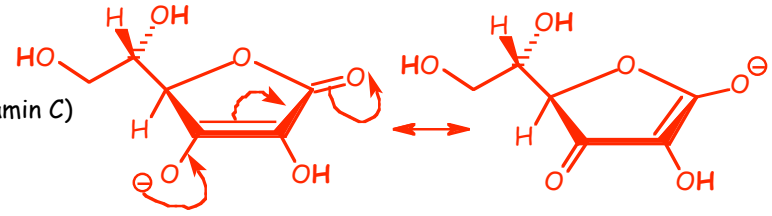


a) $NaBH_4$, then $H_3O^{\oplus}$ b) $LiAlH_4$, then $H_3O^{\oplus}$ c) H_2/Pd d) BH_3, then $H_3O^{\oplus}$

19. Ascorbic acid (vitamin C) is not a carboxylic acid, but does contain an acidic hydrogen atom (pKa 4.7). Which hydrogen of ascorbic acid is the most acidic? (Resonance is the key here.)



Ascorbic acid (Vitamin C)



20. What is the most likely product from the following series of reactions?